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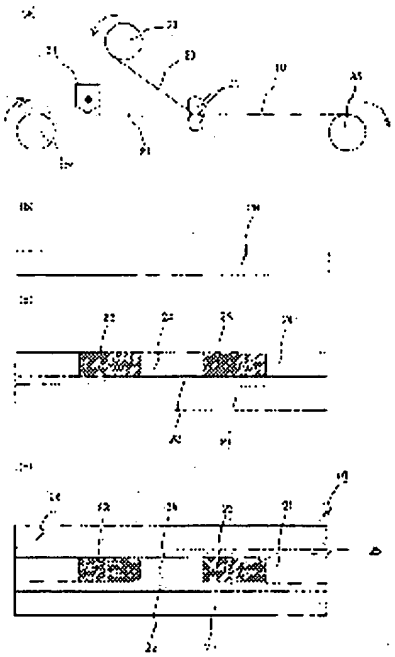
(54) LAMINATED PART MANUFACTURING METHOD AND GREEN SHEET WITH BUILT-IN ELECTRODE

(57)Abstract:



PROBLEM TO BE SOLVED: To manufacture a defect-free laminated part by improving electrode transfer, support sheet peeling, and lamination accuracy.
SOLUTION: The laminated part is manufactured by laminating self-standing green sheets each comprising an inorganic and polymer resin ingredients and provided with electrodes formed on the surface. The method comprises a step of forming on a supporting sheet a peeling layer containing a dielectric substance, a step of forming on the peeling layer an electrode layer and a margin pattern layer equivalent to the electrode layer in thickness, a step of forming an adhesive layer either on the surfaces of the electrode layer and the margin pattern layer or on the surface of the self-standing green sheet, a step of bonding the self-standing green sheet via the adhesive layer to surfaces of the electrode layer and the margin pattern layer for the acquisition of an electrode-provided green sheet as supported on the supporting sheet, and a step of, for instance, peeling off the electrode-provided green sheet for lamination. The bonding of the electrode layer and the margin pattern layer may be accomplished with the self-standing green sheet supported on a supporting body.

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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the green sheet with an electrode used for production of laminating components further about the manufacture approach of laminating components, such as a chip capacitor.
[0002]
[Description of the Prior Art]
Manufacture of laminating components, such as CR built-in substrate, a laminating inductor, a stacked type ceramic condenser, and a multilayer substrate, carries out the laminating of the thing in which the electrode layer was formed on the front face, using the ceramic original fabric sheet called a green sheet, and is performed by calcinating this. In this case, as a green sheet, the ceramic coating which consists of ceramic powder, binders (acrylic resin, butyral system resin, etc.), a plasticizer, and organic solvents (toluene, alcohol, methyl ethyl ketone, etc.) is usually prepared, and the ceramic green sheet which applies this ceramic coating on a support sheet, it is made to carry out stoving using a doctor blade method etc., and is obtained is used.
[0003]
By the way, with the miniaturization of electronic equipment, and thin-shape-izing, the miniaturization of laminating components, such as a stacked type ceramic condenser, is also accelerated, and it is in the inclination for the green sheet to be used to also become thin in recent years. In such a situation, since the aforementioned ceramic green sheet is weak and handling is difficult for it, it is what has a complicated laminating activity. So, recently, after mixing dielectric materials and ultra high molecular weight polyethylene and carrying out extrusion molding, the approach using the ceramic green sheet of the high intensity independence nature obtained by carrying out biaxial extension is proposed (see for example, the patent reference 1 grade).
[0004]
If how to manufacture a stacked type ceramic condenser using the above-mentioned high intensity self-standing ceramic green sheet is explained concretely, the conductive paste which mixed metal powder, such as nickel, and resinous principles, such as ethyl cellulose, will be first printed in the configuration of a request [on a high intensity self-standing ceramic green sheet] by print processes. This conductive paste serves as an internal electrode layer by calcinating. Next, two or more high intensity self-standing ceramic green sheets which printed this conductive paste are prepared, what carried out the laminating is cut in the shape of a chip, and it considers as the Green chip so that an internal electrode layer may counter by turns on both sides of a high intensity self-standing ceramic green sheet, and an external electrode is formed after calcinating these Green chips, and laminating components, such as a stacked type ceramic condenser, are obtained.
[0005]
It can excel in reinforcement, and from handling being easy, a high intensity self-standing ceramic green sheet exfoliates from a support sheet, and the laminating of it can be carried out and it can do a

laminating activity an easy thing, for example. Moreover, with the technique of patent reference 1 publication, since he is trying to support further a high intensity self-standing ceramic green sheet with a base material in the case of electrode formation, the effectiveness of not making a green sheet producing elongation and a wrinkle even if heat is added at the time of desiccation of the electrode layer printed, for example can also be acquired.

[0006]

However, since extension formation is carried out, the fault that porosity is high and the electric conduction component in conductive paste sinks into the pore of a green sheet by the approach of printing conductive paste to a ceramic green sheet as mentioned above may generate a high intensity self-standing ceramic green sheet. As stated also in advance, in order to attain high capacity-ization in a stacked type ceramic condenser, the demand to the lamination of a ceramic green sheet is increasing every year, and the electric conduction component which sank in causes a poor short circuit in many cases with the ceramic green sheet to which lamination of the recent years was carried out.

[0007]

Then, in order to cancel such fault, direct conductive paste is not printed on the front face of a ceramic green sheet, but after printing conductive paste and forming the conductor layer of a desired configuration on the base film prepared independently, the approach of imprinting this conductor layer on a ceramic green sheet is proposed (see for example, the patent reference 2 grade).

[0008]

Since according to the approach of this patent reference 2 publication the organic component in a conductor layer (electrode layer) decreases, a fluidity becomes low and invasion of the conductor layer to the inside of a ceramic green sheet can be controlled to the minimum, a poor short circuit can be reduced.

[0009]

[Patent reference 1]

JP,2003-45737,A

[0010]

[Patent reference 2]

JP,2001-44071,A

[0011]

[Problem(s) to be Solved by the Invention]

However, by the approach of patent reference 2 publication, since the field where the electrode layer was formed on the base film, and the field which is not formed exist, the level difference by the electrode layer arises on a base film, it becomes uneven pressurizing this level difference in an imprint process owing to, and there is a problem that a smooth imprint is barred. Moreover, stacking faults, such as a nonlaminable field, i.e., a non lamination etc., are made easy to generate, in order that this level difference is not put a pressure and it may make it homogeneity later also in the process which carries out the laminating of the green sheet with which the electrode layer was imprinted, and is pressurized.

[0012]

Moreover, by the approach of patent reference 2 publication, resin, such as acrylic resin, melamine resin, an epoxy resin, and silicon resin, is used as a mold release layer formed on a base film in order to make exfoliation of a base film easy. If thickness is set to 0.2 micrometers or more in this case, defects, such as delamination and a void, will occur in a debinder processing process. Conversely, if thickness is too thin, a mold release layer will swell or dissolve with the organic solvent contained in conductive paste at the time of printing of an electrode layer, the function as stratum disjunctum is lost, namely, since conductive paste will be directly printed on a base film, un-arranging [that exfoliation of an electrode layer becomes difficult] arises. Moreover, it gets worse, and the printing nature of an electrode layer may also be crawled and a blot etc. may generate it.

[0013]

Furthermore, in order to imprint an electrode layer on the surface of a green sheet, a high pressure and high heat are needed, for this reason deformation of a green sheet, an electrode layer, and a base film

tends to take place, and un-arranging [that the precision of the laminating in a laminating process falls], and destruction of a green sheet may cause a poor short circuit.

[0014]

Then, this invention is proposed in view of such the conventional actual condition. Employing efficiently the merit of using the self-standing green sheet that the laminating of the imprint nature of an electrode layer, the detachability of a support sheet, and the precision of a laminating can be carried out in the condition of could improve and having exfoliated from the base material It aims at offering the green sheet with an electrode used for the manufacture approach of laminating components which can manufacture laminating components without a defect, and the manufacture approach of this laminating component.

[0015]

[Means for Solving the Problem]

In order to attain the above-mentioned purpose, the manufacture approach of the laminating components concerning invention of the 1st of this application The process which forms an electrode in the front face of the self-standing green sheet containing a mineral matter component and a macromolecule resinous principle, is the manufacture approach of laminating components of carrying out the laminating of this and manufacturing laminating components, and forms the stratum disjunctum containing a dielectric on a support sheet, While forming the electrode layer of a predetermined pattern on the stratum disjunctum formed on the above-mentioned support sheet The process which forms the margin patterned layer of the same thickness in the field in which an electrode layer is not formed substantially with an electrode layer, The process which forms a glue line in either the front face of the electrode layer on the above-mentioned support sheet, and a margin patterned layer, or the front face of a self-standing green sheet, It is characterized by having the process which obtains the green sheet with an electrode in the condition that the front face of the electrode layer on the above-mentioned support sheet and a margin patterned layer supported the above-mentioned self-standing green sheet with lamination and a support sheet through the glue line, and the process which carries out the laminating of the above-mentioned green sheet with an electrode.

[0016]

since an electrode layer is formed of an imprint on a self-standing green sheet in the manufacture approach of the laminating components constituted as mentioned above -- the time of the electrode stratification -- sinking in -- etc. -- there is no fear, invasion of the conductor ingredient to the inside of a self-standing green sheet is controlled, and a poor short circuit is canceled.

[0017]

moreover, the front face of an electrode layer or a self-standing green sheet -- spreading -- or since a glue line is formed by imprint, an adhesive property with a self-standing green sheet, an electrode layer, and a margin patterned layer improves, and the imprint of the green sheet to the electrode layer and margin patterned layer on a support sheet will become easy.

[0018]

Furthermore, it faces imprinting a green sheet to an electrode layer and a margin patterned layer, and a high pressure or high heat are not needed, but deformation takes place to neither a green sheet, nor an electrode layer and a base film, and un-arranging -- un-arranging [that the precision of the laminating in a laminating process falls], and destruction of a green sheet cause a poor short circuit -- is canceled.

[0019]

Since the stratum disjunctum containing a dielectric is formed between a support sheet, an electrode layer, and a margin patterned layer further again, the adhesive strength of a support sheet to an electrode layer and a margin patterned layer can be reduced, and a support sheet, an electrode layer, and a margin patterned layer can be exfoliated easily. Therefore, the repeat of the pressurization press for an electrode layer imprint which is indicated by the patent reference 2 for an electrode layer imprint is unnecessary, it exfoliates from a support sheet, the laminating of the green sheet in which the electrode layer was formed can be carried out, and the merit by using a self-standing green sheet can be efficiently employed in the maximum. Specifically it exfoliates from a support sheet, the laminating of Green with an

electrode can be carried out easily, and a high laminating precision is acquired.
[0020]
Moreover, stratum disjunctum turns into a part of dielectric layer after baking, even when stratum disjunctum remains in an electrode layer after exfoliating a support sheet since a dielectric is included. For this reason, defects, such as delamination and a void, are not caused. Moreover, the electrode printing nature to the stratum disjunctum top containing a dielectric is good, is crawled, and does not produce faults, such as a blot.
[0021]
Since the margin patterned layer of the same thickness is substantially formed in the field in which the electrode layer on stratum disjunctum is not formed with an electrode layer further again, the level difference which originates in the shape of [of an electrode layer] toothing is canceled. For this reason, since a uniform pressure can be put in case an electrode layer is imprinted to up to a self-standing green sheet, imprint nature improves. Moreover, the laminating of the green sheet with which the electrode layer was imprinted is carried out, and also in the process to pressurize, since a uniform pressure can be put, generating of stacking faults, such as a non lamination, is also reduced.
[0022]
In the manufacture approach of above-mentioned laminating components, it can also consider as the condition that the self-standing green sheet was also supported with the support sheet on the occasion of imprint formation of an electrode layer. It is the manufacture approach of the laminating components which require having specified this for invention of the 2nd of this application. An electrode is formed in the front face of the self-standing green sheet containing a mineral matter component and a macromolecule resinous principle. The process which is the manufacture approach of laminating components of carrying out the laminating of this and manufacturing laminating components, and laminates a self-standing green sheet possible [exfoliation] on the 1st support sheet, While forming the electrode layer of a predetermined pattern on the process which forms the stratum disjunctum containing a dielectric on the 2nd support sheet, and the stratum disjunctum formed on the support sheet of the above 2nd The process which forms the margin patterned layer of the same thickness in the field in which an electrode layer is not formed substantially with an electrode layer, The process which forms a glue line in either of the front faces of the electrode layer on the front face of the self-standing green sheet on the support sheet of the above 1st, or the support sheet of the above 2nd, and a margin patterned layer, A glue line is minded for the electrode layer and margin patterned layer on the self-standing green sheet on the support sheet of the above 1st, and the support sheet of the above 2nd. Lamination, It exfoliates any of the 1st support sheet of the above, or the 2nd support sheet they are, and is characterized by having the process which obtains the green sheet with an electrode in the condition of having been supported by either the 1st support sheet or the 2nd support sheet, and the process which carries out the laminating of the above-mentioned green sheet with an electrode.
[0023]
On the other hand, the green sheet with an electrode concerning this invention is characterized by carrying out imprint formation of the electrode layer formed at the predetermined pattern on the front face of the self-standing green sheet containing a mineral matter component and a macromolecule resinous principle.
[0024]
The above green sheets with an electrode of a configuration do not have invasion of the conductor ingredient to the inside of a self-standing green sheet, and when a laminating is carried out, a poor short circuit does not generate them. Moreover, by using this, the layered product of a desired number of layers can be obtained easily, and it becomes producible [reliable laminating components] efficiently.
[0025]
Moreover, the sheet for laminating components manufacture of this invention equips the front face of the self-standing green sheet containing a mineral matter component and a macromolecule resinous principle with the green sheet with an electrode with which it comes to carry out imprint formation of the electrode layer of a predetermined pattern, and is characterized by sticking a support sheet on one

[at least] field of the above-mentioned green sheet with an electrode through stratum disjunctum.
[0026]
For example, if a support sheet is stuck at least on one side of a green sheet with an electrode, it is possible for handling to become easy and to raise the commodity value of a green sheet with an electrode.
[0027]
[Embodiment of the Invention]
Hereafter, the manufacture approach of the laminating components of this invention and a green sheet with an electrode, and the sheet for laminating components manufacture are explained, referring to a drawing.
[0028]
As laminating components manufactured by this invention, a stacked type ceramic condenser is mentioned as an example, and is explained below. As shown in drawing 1 , a stacked type ceramic condenser 1 has a capacitor element pack 2, and the 1st terminal electrode 3 and the 2nd terminal electrode 4. A capacitor element pack 2 has a dielectric layer 5 and the internal electrode layer 6, and the laminating of these internal electrode layers 6 has been carried out by turns between dielectric layers 5. The laminating of while is carried out by turns, and the internal electrode layer 6 is electrically connected with the 1st terminal electrode 3 formed in the 1st edge 2a side of a capacitor element pack 2. Moreover, the internal electrode layer 6 of another side by which a laminating is carried out by turns is electrically connected with the 2nd terminal electrode 4 formed in the 2nd edge 2b side of a capacitor element pack 2.
[0029]
In this invention, the internal electrode layer 6 is formed by imprinting the electrode layer 23 to the self-standing green sheet 26 so that it may explain to a detail later.
[0030]
Especially the quality of the material of a dielectric layer 5 is not limited, for example, consists of dielectric materials, such as titanic-acid calcium, strontium titanate, and/or barium titanate. Although especially the thickness of each dielectric layer 5 is not limited, its several micrometers - hundreds of micrometers thing is common. At this invention, lamination of the 5 micrometers or less 3 micrometers or less is especially carried out to 1 micrometer or less preferably especially preferably.
[0031]
Although especially the quality of the material of the 1st terminal electrode 3 and the 2nd terminal electrode 4 is not limited, either, although copper, a copper alloy, nickel, a nickel alloy, etc. are used, the alloy of silver, silver, and palladium etc. can usually be used. Although especially the thickness of the 1st terminal electrode 3 and the 2nd terminal electrode 4 is not limited, either, it is usually 10 micrometers - about 50 micrometers.
[0032]
What is necessary is just to determine suitably the configuration and size of a stacked type ceramic condenser 1 according to the purpose or an application. When a stacked type ceramic condenser 1 is a rectangular parallelepiped configuration, vertical x horizontal x thickness is usually x(0.6mm - 5.6mm, preferably 0.6mm - 3.2mm) (0.3mm - 5.0mm, preferably 0.3mm - 1.6mm) x (0.1mm - 1.9mm, preferably 0.3mm - 1.6mm) extent.
[0033]
Next, an example of the manufacture approach of the stacked type ceramic condenser 1 concerning this operation gestalt is explained.
[0034]
The stacked type ceramic condenser 1 shown in drawing 1 is obtained a debinder and by calcinating, after exfoliating the green sheet 20 with an electrode from the sheet 10 for laminating components manufacture as shown in drawing 2 , carrying out two or more laminatings of this and cutting in desired magnitude. Then, the whole sheet 10 configuration and manufacture approach for laminating components manufacture which are shown in drawing 2 are explained first, and how to use the green

sheet 20 with an electrode of this sheet 10 for laminating components manufacture next, and to manufacture a stacked type ceramic condenser 1 is explained.

[0035]

The sheet 10 for laminating components manufacture shown in drawing 2 is the field in which the stratum disjunctum 22 formed on one field of the carrier sheet 21 as the 1st support sheet, the electrode layer 23 formed in the configuration of a request on stratum disjunctum 22, and the electrode layer 23 are not formed. It has the electrode layer 23, the margin patterned layer 24 formed on the stratum disjunctum 22 which it is on the same field, the glue line 25 formed on the electrode layer 23 and the margin patterned layer 24, and the self-standing green sheet 26 pasted up on the glue line 25. Here, the carrier sheet 21 is pasted up in the condition that it can exfoliate, to the electrode layer 23 and the margin patterned layer 24 through stratum disjunctum 22, the self-standing green sheet 26 becomes the form imprinted by stratum disjunctum 22, the electrode layer 23, the margin patterned layer 24, and the glue line 25, and the green sheet 20 with an electrode is constituted.

[0036]

The sheet 10 for laminating components manufacture can be manufactured by the 1st manufacture approach shown in drawing 3 - drawing 6 .

[0037]

First, as shown in drawing 3 , the carrier sheet 21 is prepared as the 1st support sheet, and stratum disjunctum 22 is formed on it.

[0038]

In order to use a polyethylene terephthalate (PET) film etc., for example and to improve detachability as a carrier sheet 21, what is coated with silicone etc. is desirable. Although especially the thickness of the carrier sheet 21 is not limited, it is 5-100 micrometers preferably.

[0039]

Stratum disjunctum 22 reduces the adhesive strength of the carrier sheet 21 to the electrode layer 23 and the margin patterned layer 24, and in the laminating process of the sheet 10 for laminating components manufacture mentioned later, it is formed in order to make easy alternative exfoliation with the carrier sheet 21, the electrode layer 23, and the margin patterned layer 24. In this invention, stratum disjunctum 22 contains the same dielectric particle as the dielectric which constitutes the self-standing green sheet 26 mentioned later. Moreover, this stratum disjunctum 22 contains a binder, and the remover and plasticizer as an arbitration component in addition to a dielectric particle. Although the particle size of a dielectric particle may be the same as the particle size of the dielectric particle contained in the self-standing green sheet 26, its more small thing is desirable.

[0040]

As for the thickness of stratum disjunctum 22, it is desirable that it is the thickness below the thickness of the electrode layer 23, and it sets it up to 30% or less preferably [it is desirable and] to 60% or less of thickness, and a pan. The minimum of the thickness of stratum disjunctum 22 is determined as stratum disjunctum 22 with the particle size of an usable dielectric raw material etc., and is 0.05-0.1 micrometers preferably. There is an inclination for the electrode layer 23 to stop being able to exfoliate easily from the carrier sheet 21, and for an imprint to become difficult at the time of the imprint of the electrode layer 23 if the thickness of stratum disjunctum 22 is too thin, if the thickness of stratum disjunctum 22 is too thick conversely, the thickness of a dielectric layer will increase as a result and the property which electrostatic capacity fell and aimed at will not be acquired.

[0041]

Especially as the method of application of stratum disjunctum 22, although not limited, since it is necessary to form very thinly, the method of application using a wire bar coating machine is desirable. In addition, adjustment of the thickness of stratum disjunctum can be performed by choosing the wire bar coating machine of a different wire gage. Namely, what is necessary is just to choose the thing of a thick wire gage that what is necessary is just to choose what has a small wire gage in order to make spreading thickness of stratum disjunctum thin, in order to form thickly conversely. Stratum disjunctum 22 is dried after spreading. Drying temperature is 50-100 degrees C preferably, and the drying time is 1 -

10 minutes preferably.
[0042]
As a binder for stratum disjunctum 22, it consists of acrylic resin, a polyvinyl butyral, a polyvinyl acetal, polyvinyl alcohol, polyolefine, polyurethane, polystyrene, quality of organic that consists of these copolymers, or an emulsion, for example.
[0043]
Especially as a plasticizer for stratum disjunctum 22, although not limited, phthalic ester, an adipic acid, phosphoric ester, and glycols are illustrated, for example.
[0044]
Especially as a remover for stratum disjunctum 22, although not limited, paraffin, a wax, silicon oil, etc. are illustrated, for example.
[0045]
a binder -- the inside of stratum disjunctum 22 -- the dielectric particle 100 weight section -- receiving -- desirable -- the 2.5 - 200 weight section -- further -- desirable -- 5 - 30 weight section -- it is especially contained with 8 - 30 weight section extent preferably.
[0046]
a plasticizer -- the inside of stratum disjunctum 22 -- the binder 100 weight section -- receiving -- the 0 - 200 weight section -- desirable -- the 20 - 200 weight section -- it is contained with 50 - 100 weight section extent still more preferably.
[0047]
a remover -- the inside of stratum disjunctum 22 -- the binder 100 weight section -- receiving -- the 0 - 100 weight section -- desirable -- 2 - 50 weight section -- it is contained with 5 - 20 weight section extent still more preferably.
[0048]
After forming stratum disjunctum 22 in the front face of the carrier sheet 21, as shown in drawing 4 , the electrode layer 23 which will constitute the internal electrode layer 12 after baking is formed in the front face of stratum disjunctum 22 by the predetermined pattern. 0.1-5 micrometers of thickness of the electrode layer 23 are about 0.1-1.5 micrometers more preferably. The electrode layer 23 may consist of two or more layers from which you may constitute from a single layer, or two or more presentations differ.
[0049]
The electrode layer 23 can be formed in the front face of stratum disjunctum 22 with film methods, such as the thick-film forming methods, such as print processes which use conductive paste, or vacuum evaporationo, sputtering, and CVD (Chemical Vapor Deposition). With the screen printing or gravure which is a kind of a thick-film method, in forming the electrode layer 23 in the front face of stratum disjunctum 22, it carries out by [as being the following].
[0050]
First, conductive paste is prepared. Conductive paste kneads and prepares the various oxide used as the conductor ingredient which consists of various conductive metals or an alloy, or the dielectric materials described above after baking, an organometallic compound or resinate, and an organic vehicle.
[0051]
Such mixture etc. is used for nickel, a nickel alloy, and a pan as a conductor ingredient used in case conductive paste is manufactured. Especially a limit does not have such a conductor ingredient in the configurations, such as the shape of a globular shape and a scale, and the thing of these configurations may mix it. Moreover, 0.1-2 micrometers of about 0.2-1-micrometer things should just usually be preferably used for the mean particle diameter of a conductor ingredient.
[0052]
An organic vehicle contains a binder and a solvent. As a binder, although ethyl cellulose, acrylic resin, a polyvinyl butyral, a polyvinyl acetal, polyvinyl alcohol, polyolefine, polyurethane, polystyrene, or these copolymers are illustrated, for example, butyral systems, such as a polyvinyl butyral, are especially desirable.

[0053]
A binder is 4 - 20 weight **** rare ** preferably to the conductor ingredient (metal powder) 100 weight section in conductive paste. As a solvent, each well-known thing, such as a terpineol, butyl carbitol, and kerosine, is usable, for example. Let a solvent content preferably be 20 - 55 mass % extent to the whole paste.
[0054]
It is desirable that a plasticizer is contained in conductive paste for an improvement of an adhesive property. As a plasticizer, phthalic ester, such as benzyl butyl phthalate (BBP), an adipic acid, phosphoric ester, and glycols are illustrated. A plasticizer is the 10 - 200 weight section preferably [it is desirable and] to the 10 - 300 weight section and a pan to the binder 100 weight section in conductive paste.
[0055]
After forming the conductive paste layer of a predetermined pattern, as shown in drawing 4 , the margin patterned layer 24 of the same thickness is substantially formed in the front face of stratum disjunctum 22 in which the electrode layer 23 is not formed with the electrode layer 23. Moreover, before forming the conductive paste layer of a predetermined pattern and forming the electrode layer 23, the margin patterned layer 24 may be formed.
[0056]
The margin patterned layer 24 can be formed by print processes etc., using the ceramic paste containing the dielectric materials which constitute the self-standing green sheet 26 shown in drawing 2 , an organic solvent, a binder, and a plasticizer. The electrode layer 23 and the margin patterned layer 24 are dried if needed. Although especially drying temperature is not limited, it is 70-120 degrees C preferably, and the drying time is 5 - 15 minutes preferably.
[0057]
After forming the electrode layer 23 and the margin patterned layer 24 in the front face of stratum disjunctum 22, as shown in drawing 5 , a glue line 25 is formed in the front face of the electrode layer 23 and the margin patterned layer 24 by the applying method. However, a coating machine etc. is used and this glue line 25 carries out spreading formation just before lamination with the self-standing green sheet 26, as shown in below-mentioned drawing 6 (a).
[0058]
The presentation of a glue line 25 is the same as that of stratum disjunctum 22 except a dielectric particle not being included. That is, a glue line 25 contains a binder, a plasticizer, and a release agent. When forming a glue line with thickness thinner than the particle size of a dielectric particle, do not make it better [to include a dielectric particle, although the same dielectric particle as the dielectric which constitutes the self-standing green sheet 26 may be included in a glue line 25].
[0059]
You may differ, although it is desirable as the binder and plasticizer for a glue line 25 that it is the same as stratum disjunctum 22.
[0060]
a plasticizer -- the inside of a glue line 25 -- the binder 100 weight section -- receiving -- the 0 - 200 weight section -- desirable -- the 20 - 200 weight section -- it is contained with 50 - 100 weight section extent still more preferably.
[0061]
A glue line 25 is formed in the front face of the electrode layer 23 and the margin patterned layer 24 by approaches, such as for example, the die coating-machine method, the reverse coating-machine method, and the kiss coating-machine method, and is dried if needed. Although especially drying temperature is not limited, it is room temperature -80 degree C preferably, and the drying time is 1 - 5 minutes preferably.
[0062]
Next, the self-standing green sheet 26 is prepared. The self-standing green sheet 26 used here can be obtained as follows, as indicated for example, in the patent No. 2999254 official report. That is, first, a

mineral matter component and a macromolecule resinous principle are mixed with a solvent, and suspension is obtained. Next, extrusion molding of this suspension is carried out, and a film-like Plastic solid is acquired. Next, biaxial stretching of the film-like Plastic solid is carried out, and the self-standing green sheet 26 is obtained.

[0063]

this self-standing green sheet 26 -- a porosity film -- it is -- a void content -- one to 80 volume % -- it is five to 50 volume % preferably. Especially as an inorganic substance component contained in this self-standing green sheet 26, although not limited, the various dielectric materials which serve as ceramics, for example after sintering are illustrated.

[0064]

Moreover, especially as a macromolecule resinous principle contained in the self-standing green sheet 26, although not limited, a with a weight average molecular weight of 400,000 or more polymer, especially with a weight average molecular weight of 400,000 or more polyolefine are used preferably, for example. If shaping to a green sheet is possible for the molecular weight of a macromolecule resinous principle, its higher one is desirable in respect of ductility and reinforcement, and 1 million or more are still more desirable. It is desirable that it is the polyolefine which consists of either polyethylene, polyvinyl alcohol and those copolymers as polyolefine, and especially polyethylene is desirable.

[0065]

Although especially the content rate of the mineral matter component and macromolecule resinous principle in the self-standing green sheet 26 is not limited, it is desirable that a mineral matter component is 50 - 95 % of the weight, and a macromolecule resinous principle is 50 - 5 % of the weight. Although the content of a mineral matter component is so advantageous to removal of the macromolecule resinous principle in a back process that it is high, from a viewpoint of configuration maintenance of a sheet, the content of a macromolecule resinous principle is 7 - 20 % of the weight especially preferably six to 35% of the weight still more preferably.

[0066]

The thickness of the self-standing green sheet 26 is chosen according to an application etc., for example, is 1 micrometer - about 50 micrometers, and if thickness after baking is set to about 1 micrometer or less, it is necessary to set it to about 3 micrometers or less. As for a thin sheet 3 micrometers or less, it is effective that many pores tend to be formed and apply this invention.

[0067]

And as shown in drawing 6 (a), the electrode layer 23 and the margin patterned layer 24, and the self-standing green sheet 26 are pasted up. The electrode layer 23 and the margin patterned layer 24 of the carrier sheet 21 are forced on the front face of the self-standing green sheet 26 through a glue line 25, heating pressurization is carried out, and, specifically, the electrode layer 23 and the margin patterned layer 24, and the self-standing green sheet 26 are pasted up.

[0068]

Although it is necessary to form a glue line 25 in the front face of the electrode layer 23 and the margin patterned layer 24, or the front face of the self-standing green sheet 26 by spreading or imprint at this time, he is trying to form a glue line 25 in the front face of the electrode layer 23 and the margin patterned layer 24 here just before lamination with the self-standing green sheet 26 using coater 31.

[0069]

Although the pressurization and heating by the calender roll may be used for heating and pressurization also at the pressurization and heating by the press, it is desirable to carry out with the roller 32 of a pair. Moreover, it is desirable to set the pressure at the time of pressurization to 0.2-15MPa, and to make temperature into about 40-100 degrees C.

[0070]

The continuous carrier sheet 21 with which the electrode layer 23 as shown in drawing 6 (c), the margin patterned layer 24, and stratum disjunctum 22 were specifically formed is continuously supplied from the 1st supply roll 33. Moreover, the self-standing green sheet 26 as shown in drawing 6 (b) is

continuously supplied from the 2nd supply roll 34. Next, after carrying out spreading formation of the glue line 25 on the front face of the electrode layer 23 and the margin patterned layer 24, the glue line 25 side of the carrier sheet 21 shown in the self-standing green sheet 26 and drawing 6 (c) is pressurized with the roller 32 of superposition and a pair, and the self-standing green sheet 26 and a glue line 25 are pasted up. The sheet 10 for laminating components manufacture obtained as the result is rolled round on the winding roll 35. This sheet 10 for laminating components manufacture will be in the condition of having been supported with the carrier sheet 21 which the self-standing green sheet 26 is stuck on the front face of the electrode layer 23 and the margin patterned layer 24 through a glue line 25, and supports the electrode layer 23 and the margin patterned layer 24, as [show / in drawing 2 and drawing 6 (d)].

[0071]

Next, after tearing off the green sheet 20 with an electrode from the sheet 10 for laminating components manufacture and cutting the long picture-like green sheet 20 with an electrode with a predetermined dimension, two or more sheet laminating of this is carried out, a layered product is obtained, and a stacked type ceramic condenser is obtained through cutting, debinder processing, and baking.

[0072]

If the production process of this stacked type ceramic condenser is explained, since the electrode layer 23 and margin patterned layer 24 side is first supported with the carrier sheet 21 the front face of the green sheet 20 with an electrode, and here, a glue line is beforehand formed in the front face of the self-standing green sheet 26. As for the thickness, it is [a glue line] desirable to be referred to as 0.2 micrometers or less.

[0073]

And as the green sheet 20 with an electrode in which the glue line was formed is removed from the carrier sheet 21 and it is shown in drawing 7 (a) after cutting in a predetermined dimension, a laminating is piled up and carried out so that it may become the number of layers of a request of this within metal mold 36, and preliminary pressurization is given. 10-1000MPa of welding pressure is desirable, and its 10-400MPa is still more desirable. Moreover, temperature at the time of preliminary pressurization is usually performed at a room temperature. The situation of the laminating of this green sheet 20 with an electrode is shown in drawing 8 . On the occasion of a laminating, the sheet 37 for outer layers with which neither the electrode layer 23 nor the margin patterned layer 24 is formed as shown in drawing 8 is prepared, and it piles up by turns through the glue line 38 which formed previously green sheet 20with electrode A for inner layers, and green sheet 20with electrode B on this, and is ******. It is made, as for the direction of [when piling up and sticking each green sheets 20A and 20B with an electrode], for the electrode layer 23 and the margin patterned layer 24, and the self-standing green sheet 26 to surely counter here. In addition, although each of green sheet 20with electrode A for inner layers and green sheet 20with electrode B is the green sheets 20 with an electrode, the directions of a drawer of the electrode layer 23 differ. Green sheet 20with electrode A constitutes the layer which pulls out the electrode layer 23 on the left-hand side in drawing, and green sheet 20with electrode B constitutes the layer which pulls out the electrode layer 23 to a drawing Nakamigi side. Finally the sheet 39 for outer layers is piled up, it considers as a layered product 40, and a laminating process is ended.

[0074]

Then, as shown in drawing 7 (b), the last pressurization of this layered product 40 is carried out within metal mold 41. The pressure at the time of the last pressurization is 10-1000MPa preferably. Moreover, room temperature -200 degree C of temperature is desirable again at the time of pressurization. After that, as shown in drawing 7 (c), the cutting gear tooth 42 cuts a layered product 40 in a predetermined dimension, and as shown in drawing 7 (d), Green chip 40a is formed. Heat treatment is performed in order for this Green chip 40a to make a dielectric layer reoxidate by performing debinder processing and baking processing.

[0075]

Although what is necessary is just to perform debinder processing on condition that usual, when using base metal, such as nickel and a nickel alloy, for the conductor ingredient of an internal electrode layer,

it is desirable to carry out on condition that the following especially.
Programming rate: It is [hour] 10-50 degrees C/hour especially 5-300 degrees C /.
Retention temperature: It is 250-350 degrees C especially 200-400 degrees C.
Holding time: It is 1 - 10 hours especially for 0.5 to 20 hours.
Ambient atmosphere : mixed gas of N2 and H2 which were humidified
Baking conditions have the following desirable conditions.
Programming rate: It is [hour] 200-300 degrees C/hour especially 50-500 degrees C /.
Retention temperature: It is 1150-1250 degrees C especially 1100-1300 degrees C.
Holding time: It is 1 - 3 hours especially for 0.5 to 8 hours.
Cooling rate: It is [hour] 200-300 degrees C/hour especially 50-500 degrees C /.
Controlled atmosphere: Mixed gas of N2 and H2 which were humidified etc.
[0076]
However, as for especially the oxygen tension in the air ambient atmosphere at the time of baking, it is [ten to seven or less] desirable to carry out in 10-7 to ten to 13 Pa. It is in the inclination for an internal electrode layer to oxidize if said range is exceeded, and when oxygen tension is too low, the electrode material of an internal electrode layer is in a lifting and the inclination which breaks off about abnormality sintering.
[0077]
Heat treatment after performing such baking performs still more preferably retention temperature or 1000 degrees C or more of maximum temperatures as 1000-1100 degrees C preferably. It is in the inclination for the nickel of an internal electrode to oxidize if it is in the inclination for an insulation resistance life to become [the retention temperature at the time of heat treatment, or a maximum temperature] short since said under range of oxidation of dielectric materials is inadequate and said range is exceeded, and to react not only with capacity falling but with a dielectric base, and for a life to also become short. The oxygen tension at the time of heat treatment is oxygen tension higher than the reducing atmosphere at the time of baking, and is ten to 2 Pa - 1Pa more preferably ten to 3 Pa - 1Pa. Under in said range, when reoxidation of a dielectric layer 2 is difficult and exceeds said range, it is in the inclination for an internal electrode layer to oxidize. And the following conditions of other heat treatment conditions are desirable.
Holding time: It is 2 - 5 hours especially for 0 to 6 hours.
Cooling rate: It is [hour] 100-300 degrees C/hour especially 50-500 degrees C /.
Gas for ambient atmospheres: N2 humidified gas
[0078]
In addition, what is necessary is just to use WETTA etc., in order to humidify N2 gas, mixed gas, etc. In this case, about 0-75 degrees C of water temperature are desirable. Moreover, debinder processing, baking, and heat treatment may be performed continuously, respectively, or you may carry out independently. It is desirable to change an ambient atmosphere after debinder processing, when it calcinates by having changed [without cooling] the ambient atmosphere and carried out the temperature up to the retention temperature in the case of baking continuously, it subsequently cools and the retention temperature of heat treatment is reached when performing these continuously, and to heat-treat. When performing these independently, it is desirable to change an ambient atmosphere and to continue a temperature up further, after carrying out a temperature up under N2 gas or humidified N2 gas ambient atmosphere to the retention temperature at the time of debinder processing on the occasion of baking, and after cooling to the retention temperature at the time of heat treatment, it is on the other hand, desirable to change into N2 gas or humidified N2 gas ambient atmosphere again, and to continue cooling. Moreover, after carrying out a temperature up to retention temperature under N2 gas ambient atmosphere on the occasion of heat treatment, it is good also as an N2 gas ambient atmosphere which could change the ambient atmosphere and humidified all the processes of heat treatment.
[0079]
Thus, end-face polish is given to the obtained sintered compact (capacitor element pack 2) with barrel finishing, sandblasting, etc., the paste for terminal electrodes can be burned on it, and the 1st terminal

electrode 3 and the 2nd terminal electrode 4 are formed. As for the baking conditions of the paste for terminal electrodes, it is desirable to consider as for [10 minutes] - about 1 hour at 600-800 degrees C for example, in N2 gas and H2 gas which were humidified, and n mixed gas. And a pad layer is formed if needed by performing plating etc. on the 1st terminal electrode 3 and the 2nd terminal electrode 4. What is necessary is just to prepare the paste for terminal electrodes like the above-mentioned conductive paste.

[0080]

according to the above production process, a laminating can be performed after exfoliating from the carrier sheet 21 using the reinforcement of the self-standing green sheet 26 being alike compared with the conventional green sheet, and high, even if it is a thin layer sheet. Of course, as shown not only in this but in drawing 9 , the temporary stack (heat press) of the green sheet 20with electrode A in the condition of having been supported by the carrier sheet 21 on the sheet 37 for outer layers is carried out in piles. After exfoliating the carrier sheet 21, the temporary stack (heat press) of the green sheet 20with electrode B in the condition of having been supported by the carrier sheet 21 is carried out in piles, and you may make it obtain a layered product by repeating the process of exfoliating the carrier sheet 21, the number of predetermined times. Or as shown in drawing 10 , it is also possible to accumulate green sheet 20with electrode A and several green sheet 20with electrode B by turns between the carrier sheets 21, to produce inner layer unit 20U, and to make this become the number of laminatings of number unit pile ******.

[0081]

Thus, the manufactured stacked type ceramic condenser 1 is mounted in printed circuit board superiors with a pewter etc., and is used for various electronic equipment.

[0082]

As mentioned above, even when according to the 1st manufacture approach of this invention stratum disjunctum 22 has adhered to electrode layer 23 front face after exfoliating the carrier sheet 21 since stratum disjunctum 22 contains a dielectric, the survival of this stratum disjunctum 22 becomes a part of dielectric layer 5 after baking. For this reason, a stacked type ceramic condenser 1 can be manufactured, without causing defects, such as delamination and a void, even if it is the case where thickness of stratum disjunctum 22 is set to 0.2 micrometers or more, for example. Moreover, the printing nature of the electrode layer 23 to the stratum disjunctum 22 top containing a dielectric is good, is crawled, and does not produce faults, such as a blot.

[0083]

Moreover, according to the 1st manufacture approach of this invention, the level difference which originates in the shape of [of the electrode layer 23] toothing by forming the margin patterned layer 24 is canceled, and uniform pressurization can be performed. For this reason, the electrode layer 23 and the self-standing green sheet 26 can be pasted up smoothly. Moreover, also when carrying out the laminating of the green sheet 10 with an electrode and pressurizing before baking, while the external surface of a layered product is maintained at a flat surface, the electrode layer 23 does not carry out a location gap in the direction of a flat surface. And the self-standing green sheet 26 is broken through and it does not become the cause of a short circuit etc. Therefore, generating of stacking faults, such as a non lamination, can be reduced.

[0084]

Moreover, according to the 1st manufacture approach of this invention, since a glue line 25 is formed in the front face of the electrode layer 23 or the self-standing green sheet 26 by spreading or imprint, adhesion with the self-standing green sheet 26, the electrode layer 23, and the margin patterned layer 24 can be made easy. For example, in case the electrode layer 23 and the margin patterned layer 24 are pasted up on the front face of the self-standing green sheet 26, a high pressure and high heat become unnecessary and the adhesion of them at low voltage and low temperature is attained more. Moreover, in the process which carries out the laminating of the green sheet 10 with an electrode, and obtains a layered product, while the precision of a high laminating is acquired, alternative exfoliation of the carrier sheet 21 becomes easy.

[0085]
By the way, the sheet for laminating components manufacture shown in drawing 2 can also be manufactured by the 2nd manufacture approach which is explained below. This 2nd manufacture approach is the point which forms a glue line 25 with a replica method, and the point of performing adhesion and an imprint with the self-standing green sheet 26 and the electrode layer 23 where the lamination electrode layer 23 and the margin patterned layer 24 are formed for the self-standing green sheet 26 on the carrier sheet 21 as the 2nd base material at the carrier sheet 51 as the 1st support sheet, and mainly differs from the 1st manufacture approach mentioned above. according to the 2nd manufacture approach -- both the self-standing green sheet 26 the electrode layer 23 and the margin patterned layer 24 -- although -- since it is supported by the carrier sheet, it is satisfactory whichever it imprints at a side. For example, it is also possible to imprint the electrode layer 23 and the margin patterned layer 24 on the self-standing green sheet 26 supported by the carrier sheet 51, and it is also possible to imprint the self-standing green sheet 26 on the electrode layer 23 formed on the carrier sheet 21 and the margin patterned layer 24.
[0086]
In addition, the same sign is given to the member shown in drawing 3 - drawing 6 after drawing 11 , and a common member, and a part of the explanation is omitted.
[0087]
By this 2nd manufacture approach, first, as shown in drawing 11 , the self-standing green sheet 26 containing a mineral matter component and a macromolecule resinous principle is stuck possible [exfoliation] with a binder etc. to the carrier sheet 51 as the 1st support sheet.
[0088]
The carrier sheet 51 is for example, a polyethylene terephthalate (PET) sheet or a polypropylene sheet. Although especially the thickness of this carrier sheet 51 is not limited, it is 5-100 micrometers preferably. It is in the inclination for the function as a base material for the self-standing green sheet 26 to fall when the thickness of this carrier sheet 51 is too thin, and in being too thick, flexibility falls, it lengthens from the self-standing green sheet 26, and ** has ** in the inclination which becomes difficult. Therefore, the above-mentioned range is desirable.
[0089]
The same thing as the self-standing green sheet 26 used by the 1st approach mentioned above as a self-standing green sheet 26 can be used.
[0090]
The self-standing green sheet 26 which is shown in drawing 11 and which was pasted up on the carrier sheet 51 possible [exfoliation] is obtained by the approach shown in drawing 12 . As shown in drawing 12 , the continuous carrier sheet 51 is supplied from the 1st supply roll 53, by the die coating machine 54, the binder layer 52 is applied to the front face of the carrier sheet 51, after that, for example, the drying furnace which is not illustrated, is passed, and stoving of the binder layer 52 is carried out in 30-70-degreeC. Next, from the 2nd supply roll 55, with the roller 56 of a pair, the self-standing green sheet 26 supplied continuously is pressurized by the front face of the carrier sheet 51 in which the binder layer 26 was formed, and pastes up possible [exfoliation]. The carrier sheet 51 which is obtained as the result and which was pasted up in the condition that the self-standing green sheet 26 can exfoliate is rolled round by the winding roll 57.
[0091]
Especially as a binder used for the binder layer 52, although not limited, acrylic resin, a polyvinyl butyral, a polyvinyl acetal, polyvinyl alcohol, polyolefine, polyurethane, polystyrene, the quality of organic that consists of these copolymers, or an emulsion can be illustrated, for example. However, as for the glass transition temperature Tg of the ingredient which constitutes a binder, it is desirable that it is below a room temperature. This is for making adhesiveness discover in a room temperature.
[0092]
Next, like the 1st manufacture approach, as shown in drawing 3 , stratum disjunctum 22 is formed in the front face of the carrier sheet 21 as the 2nd support sheet, next as shown in drawing 4 , the electrode

layer 23 and the margin patterned layer 24 are formed in the front face of stratum disjunctum 22. The carrier sheet 21, stratum disjunctum 22, the electrode layer 23, and the margin patterned layer 24 can be considered as the same configuration as the 1st manufacture approach. Moreover, it can be made to be the same as that of the 1st manufacture approach also with the approach of forming these layers.

[0093]

Next, after forming the electrode layer 23 and the margin patterned layer 24 in the front face of stratum disjunctum 22, as shown in drawing 5 , a glue line 25 is formed in the front face of the electrode layer 23 and the margin patterned layer 24. By this 2nd manufacture approach, a glue line 25 is formed with a replica method. However, also in this case, as shown in below-mentioned drawing 14 (a), a glue line 25 needs to carry out imprint formation just before lamination with the self-standing green sheet 26.

[0094]

In order to carry out imprint formation of the glue line 25, as shown in drawing 13 (a), the sheet 60 for a glue line imprint with which the glue line 25 is formed in the front face of the carrier sheet 61 as the 3rd support sheet is prepared independently [the above-mentioned carrier sheet 21 and the above-mentioned carrier sheet 51]. The carrier sheet 61 consists of the same sheets as the carrier sheet 21 and the carrier sheet 51. A glue line 25 can consist of the same ingredients as the glue line 25 of the 1st approach.

[0095]

A glue line 25 is formed in the front face of the carrier sheet 61 as the 3rd support sheet by approaches, such as for example, the bar coating-machine method, the die coating-machine method, the reverse coating-machine method, the dip coater method, and the kiss coating-machine method, and is dried if needed. Although especially drying temperature is not limited, it is room temperature -80 degree C preferably, and the drying time is 1 - 5 minutes preferably.

[0096]

By pushing against the front face of the electrode layer 23 and the margin patterned layer 24, carrying out heating pressurization of the glue line 25 of this carrier sheet 61, as shown in drawing 13 (b), and exfoliating the carrier sheet 61 after that, as shown in drawing 13 (c), a glue line 25 is imprinted on the front face of the electrode layer 23 and the margin patterned layer 24.

[0097]

Whenever [stoving temperature / at that time] has desirable 40-100 degrees C, and 0.2-15MPa of welding pressure is desirable. Although the pressurization by the calender roll may be used also for the pressurization by the press, as for pressurization, it is desirable to carry out with the roll of a pair.

[0098]

The lamination process of the self-standing green sheet 26 stuck on the carrier sheet 51 at drawing 14 , and the electrode layer 23 and the margin patterned layer 24 which were formed on the carrier sheet 21 is shown. At this lamination process, the electrode layer 23 and the margin patterned layer 24 of the carrier sheet 21 are forced on the front face of the self-standing green sheet 26 with the carrier sheet 21 through a glue line 25, and heating pressurization is carried out. And the self-standing green sheet 26 is imprinted on the front face of the electrode layer 23 and the margin patterned layer 24 by tearing off the carrier sheet 51 by the side of the self-standing green sheet 26.

[0099]

Although the pressurization and heating by the calender roll may be used also at the pressurization and heating by the press, as it is shown in drawing 15 (a), as for heating and pressurization at the time of this imprint, it is desirable to carry out with the roller 70 of a pair. Moreover, as shown in drawing 15 (a), before the roller 70 of a pair performs pressurization and heating, it is desirable to heat beforehand the carrier sheet 21 with which the electrode layer 23 and the margin patterned layer 24 were formed in the carrier sheet 51 list which the self-standing green sheet 26 pasted up by heater 71 grade. By giving a preheating, since a heating value required to secure good imprint nature is fully given to these sheets, it can rotation speed up [of a roller 70] and the mass-production nature in an imprint process can be raised.

[0100]

The continuous carrier sheet 21 with which the electrode layer 23 as shown in drawing 15 (c), the

margin patterned layer 24, and stratum disjunctum 22 were specifically formed is supplied from the 1st supply roll 72. And the sheet 60 for a glue line imprint is supplied from a roll 62, a glue line 25 is imprinted on the electrode layer 23 and the margin patterned layer 24 with a transfer roller 63, and the carrier sheet 61 is rolled round with a roll 63.

[0101]

The carrier sheet 51 on which the self-standing green sheet 26 as shown in drawing 15 (b) was pasted up possible [exfoliation] on the other hand is supplied from the 2nd supply roll 73. A preheating is given to the carrier sheet 21 and the carrier sheet 51 which were supplied at a heater 71, next, with the roller 70 of a pair, the electrode layer 23 and the margin patterned layer 24, and the self-standing green sheet 26 are pasted up, and the self-standing green sheet 26 is imprinted to the electrode layer 23 side by tearing off the carrier sheet 51 by the side of the self-standing green sheet 26. The sheet 10 for laminating components manufacture shown in drawing 2 and drawing 15 (d) which are obtained as the result is rolled round on the 1st winding roll 74. On the other hand, the carrier sheet 51 torn off from the self-standing green sheet 26 is rolled round on the 2nd winding roll 75.

[0102]

The laminating components of stacked type ceramic condenser 1 grade can be manufactured by passing through the same process as the 1st manufacture approach mentioned above using the obtained sheet 10 for laminating components manufacture.

[0103]

As mentioned above, since according to the 2nd manufacture approach of this invention lamination has pasted up the easy self-standing green sheet 26 on the condition that it can exfoliate, to the carrier sheet 51 and performs adhesion with the electrode layer 23 and the margin patterned layer 24, and an imprint through a glue line 25 in this condition, dimensional changes, such as elongation of the self-standing green sheet 26 and a wrinkle, can be controlled. Since the carrier sheet 51 controls the dimensional change of the self-standing green sheet 26, the need of forming a tension controller etc. into each process decreases, and it becomes unnecessary moreover, to make a bearer rate and a winding rate late. Therefore, while manufacture effectiveness improves, reduction of a manufacturing cost can be aimed at. Furthermore, since the carrier sheet 51 controls the dimensional change of the self-standing green sheet 26, the self-standing green sheet 26 becomes unable to be influenced by heat easily, a preheating can be given to the self-standing green sheet 26 before an imprint, it can imprint speed up, and manufacture effectiveness can be raised.

[0104]

Moreover, even when according to the 2nd manufacture approach of this invention stratum disjunctum 22 has adhered to electrode layer 23 front face after exfoliating the carrier sheet 21 since stratum disjunctum 22 contains a dielectric, the survival of this stratum disjunctum 22 becomes a part of dielectric layer 5 after baking. For this reason, laminating components can be manufactured, without causing defects, such as delamination and a void, even if it is the case where thickness of stratum disjunctum 22 is set to 0.2 micrometers or more, for example. Moreover, the printing nature of the electrode layer 23 to the stratum disjunctum 22 top containing a dielectric is good, is crawled, and does not produce faults, such as a blot.

[0105]

Moreover, according to the 2nd manufacture approach of this invention, the level difference which originates in the shape of [of the electrode layer 23] toothing by forming the margin patterned layer 24 is canceled, and uniform pressurization can be performed. For this reason, the electrode layer 23 and the self-standing green sheet 26 can be pasted up smoothly. Moreover, also when carrying out the laminating of the green sheet 20 with an electrode and pressurizing before baking, while the external surface of a layered product is maintained at a flat surface, the electrode layer 23 does not carry out a location gap in the direction of a flat surface. And the self-standing green sheet 26 is broken through and it does not become the cause of a short circuit etc. Therefore, generating of stacking faults, such as a non lamination, can be reduced.

[0106]

Moreover, according to the 2nd manufacture approach of this invention, since a glue line 25 is formed in the front face of the electrode layer 23 or the self-standing green sheet 26, adhesion with the self-standing green sheet 26, the electrode layer 23, and the margin patterned layer 24 can be made easy. For example, in case the electrode layer 23 and the margin patterned layer 24 are pasted up on the front face of the self-standing green sheet 26, a high pressure and high heat become unnecessary and the adhesion of them at low voltage and low temperature is attained more. Moreover, in the process which carries out the laminating of the green sheet 20 with an electrode, and obtains a layered product, while the precision of a high laminating is acquired, exfoliation of the carrier sheet 21 and the carrier sheet 51 becomes easy. Since it forms with a replica method especially according to the 2nd manufacture approach, without applying a glue line 25 to the front face of the electrode layer 23 and the margin patterned layer 24 directly, formation of the very thin glue line 25 is attained. For example, thickness of a glue line 25 can be made thin to about 0.02-0.2 micrometers. Moreover, since the component of a glue line 25 does not sink into electrode layer 23 grade, there is no possibility of having a bad influence on the presentation of electrode layer 23 grade.

[0107]

In addition, although the approach of manufacturing the sheet 10 for laminating components manufacture pasted up on the electrode layer 23 and margin patterned layer 24 side in the condition that the carrier sheet 21 can exfoliate, and manufacturing laminating components using this was mentioned as the example and above-mentioned explanation explained it, as a sheet for laminating components manufacture, it is not limited to this. for example, as a sheet for laminating components manufacture of this invention The sheet 80 for laminating components manufacture of a configuration of having pasted the self-standing green sheet 26 side as shown in drawing 16 in the condition that the carrier sheet 51 can exfoliate, by the binder layer 52, As [show / in the sheet 90 for laminating components manufacture of a configuration of having pasted both by the side of the electrode layer 23 and the margin patterned layer 24 in the condition that the carrier sheets 51 and 21 can exfoliate, the self-standing green sheet 26 side as shown in drawing 17 , and drawing 18 / for example,] It is the configuration that the electrode layer 23 and the margin patterned layer 24 were imprinted on the self-standing green sheet 26, and the thing in the condition that all carrier sheets exfoliated is also included.

[0108]

Moreover, although the gestalt of operation mentioned above explained the case where a stacked type ceramic condenser was manufactured using the green sheet with an electrode and the sheet for laminating components manufacture which applied this invention, the green sheet with an electrode and the sheet for laminating components manufacture which applied this invention can be used also in case other laminating components, for example, a laminating inductor, a multilayer substrate, etc. are manufactured.

[0109]

[Example]

Next, the concrete example which applied this invention is explained based on an experimental result.

[0110]

<Example 1>

By the 1st approach mentioned above, the sheet with an electrode layer for laminating components manufacture was produced, and the capacitor element pack was actually manufactured using this.

[0111]

Formation of stratum disjunctum

Applied the dielectric slurry which consists of the plasticizer 3 weight section and an organic solvent to the barium titanate 100 weight section of 0.1 micrometers of mean diameters, the polyvinyl-butyral system resin 6 weight section, and the barium titanate 100 weight section on the carrier sheet which consists of a PET film which performed exfoliation processing by silicone system resin to the front face so that it might become the thickness after desiccation of 0.3 micrometers, and it was made to dry, and stratum disjunctum was obtained.

[0112]

Formation of an electrode layer and a margin patterned layer
Conductive paste was printed on the above-mentioned stratum disjunctum, and the electrode layer was formed so that the thickness after desiccation might be set to 1 micrometer. The desiccation conditions of an electrode layer were set as for 80 degrees C and 5 minutes. After formation of an electrode layer, on the stratum disjunctum of the field where the electrode layer is not printed using the ceramic paste which consists of the plasticizer 50 weight section and an organic solvent to the barium titanate 100 weight section of 0.2 micrometers of mean diameters, the polyvinyl-butyral system resin 8 weight section, and the barium titanate 100 weight section, applied so that it might become the thickness after desiccation of 1 micrometer, and it was made to dry, and the margin patterned layer was obtained. The desiccation conditions of a margin patterned layer were set as for 80 degrees C and 5 minutes.
[0113]
Formation of a glue line
On the obtained electrode layer and the margin patterned layer, the coating which consists of the polyvinyl-butyral system resin 100 weight section, the plasticizer 50 weight section, and an organic solvent was applied so that it might become the desiccation thickness of 0.2 micrometers or less, and it was dried, and the glue line was obtained.
[0114]
Green sheet imprint process (production of the sheet for laminating components manufacture)
Trade name SORUFIRU (trademark) was prepared as a high intensity self-standing green sheet. Between the imprint rollers of a pair with which the condition that superposition and a pressure were applied so that a self-standing green sheet and a glue line might counter rotates this self-standing green sheet and the carrier sheet with which the electrode layer and the margin patterned layer were formed was passed, and the self-standing green sheet was imprinted to the electrode layer and margin patterned layer side. Thereby, the sheet with an electrode layer for laminating components manufacture was obtained.
[0115]
Production of a laminating component
The green sheet with an electrode was exfoliated from the above-mentioned sheet for laminating components manufacture, the after [cutting] laminating was carried out to the predetermined dimension, preliminary pressurization was carried out and the layered product of a desired number of layers was obtained. The preliminary pressurization conditions at this time are in the condition which made metal mold the room temperature, and were made into the welding pressure of 20MPa. This pressurization was performed when obtaining the layered product of 100 layer structures finally. These pressurization conditions are in the condition which heated metal mold at 80 degrees C, and were made into the welding pressure of 150MPa. Stacking faults, such as a non lamination, were not observed in the layered product after this pressurization. Moreover, this layered product was cut in predetermined size, it considered as the Green chip, debinder processing, baking, and annealing (heat treatment) were performed, and the capacitor element pack was obtained. It turned out that defects, such as delamination and a void, were not observed in the obtained capacitor element pack, but the quality capacitor element pack was manufactured.
[0116]
<Example 2>
By the 2nd manufacture approach mentioned above, the sheet for laminating components manufacture was produced and the capacitor element pack was actually manufactured using this.
[0117]
The lamination of a self-standing green sheet
Trade name SORUFIRU (trademark) was used as a self-standing green sheet. This self-standing green sheet was stuck on the carrier sheet which consists of a PET film with a binder, and was made into the condition that it can exfoliate, to the carrier sheet. As a binder, the acrylic emulsion solution (Nippon Carbide Industries Co., Inc. make) was used. The glass transition temperature of a binder was -25-degreeC. The particle size of an emulsion was 0.06 micrometers. Spreading of a binder was performed

the condition for 4m/in spreading rate using the bar coating machine (wire gage of 0.075mm by the Eto machine company). After applying the binder to the carrier sheet and drying by 50-degreeC, the self-standing green sheet was stuck on the spreading side, and it was pressurized by the platen.

[0118]

Formation of stratum disjunctum

Applied the dielectric slurry which consists of the plasticizer 3 weight section and an organic solvent to the barium titanate 100 weight section of 0.1 micrometers of mean diameters, the polyvinyl-butyral system resin 6 weight section, and the barium titanate 100 weight section on the carrier sheet which consists of a PET film which performed exfoliation processing by silicone system resin to the front face so that it might become the thickness after desiccation of 0.3 micrometers, and it was made to dry, and stratum disjunctum was obtained.

[0119]

Formation of an electrode layer and a margin patterned layer

Conductive paste was printed on the above-mentioned stratum disjunctum, and the electrode layer was formed so that the thickness after desiccation might be set to 1 micrometer. The desiccation conditions of an electrode layer were set as for 80 degrees C and 5 minutes. After formation of an electrode layer, on the stratum disjunctum of the field where the **** electrode layer for a ceramic paste which consists of the plasticizer 50 weight section and an organic solvent to the barium titanate 100 weight section of 0.2 micrometers of mean diameters, the polyvinyl-butyral system resin 8 weight section, and the barium titanate 100 weight section is not printed, applied so that it might become the thickness after desiccation of 1 micrometer, and it was made to dry, and the margin patterned layer was obtained. The desiccation conditions of a margin patterned layer were set as for 80 degrees C and 5 minutes.

[0120]

Formation of a glue line

Apart from the carrier sheet for an electrode layer and margin pattern stratification, the carrier sheet with which the above-mentioned stratum disjunctum was formed was prepared. On this stratum disjunctum, the coating which consists of the polyvinyl-butyral system resin 100 weight section, the plasticizer 50 weight section, and an organic solvent was applied so that it might become the desiccation thickness of 0.2 micrometers or less, and it was dried, and the glue line was obtained.

[0121]

The imprint of a glue line

Between the imprint rollers of a pair with which the condition that passed the preheating heater section in the state of [this] superposition, and the pressure was applied rotates the obtained glue line, and an electrode layer and a margin patterned layer was passed, and the glue line was imprinted on the front face of an electrode layer and a margin patterned layer.

[0122]

Green sheet imprint process (production of the sheet for laminating components manufacture)

Superposition and the preheating heater section were passed so that a self-standing green sheet and a glue line might counter the self-standing green sheet made into the condition that it can exfoliate, to the carrier sheet, and the carrier sheet with which the electrode layer and the margin patterned layer were formed, between the imprint rollers of the pair which the condition that the pressure was applied rotates was passed, and the self-standing green sheet was imprinted to the electrode layer and margin patterned layer side. Thereby, the sheet for laminating components manufacture was obtained.

[0123]

Production of a laminating component

The green sheet with an electrode was exfoliated from the above-mentioned sheet for laminating components manufacture, the after [cutting] laminating was carried out to the predetermined dimension, preliminary pressurization was performed, and the layered product of a desired number of layers was obtained. The preliminary pressurization conditions at this time are in the condition which made metal mold the room temperature, and were made into the welding pressure of 20MPa. This pressurization was performed when obtaining the layered product of 100 layer structures finally. These

pressurization conditions are in the condition which heated metal mold at 80 degrees C, and were made into the welding pressure of 150MPa. Stacking faults, such as a non lamination, were not observed in the layered product after this pressurization. Moreover, this layered product was cut in predetermined size, it considered as the Green chip, debinder processing, baking, and annealing (heat treatment) were performed, and the capacitor element pack was obtained. In the obtained capacitor element pack, it turned out that defects, such as delamination and a void, were not observed but the quality capacitor element pack was manufactured.

[0124]

[Effect of the Invention]

According to this invention, the stratum disjunctum which contains a dielectric as stratum disjunctum is formed between a support sheet, an electrode layer, and a margin patterned layer so that clearly also from the above explanation. Since a margin patterned layer is formed in the field in which an electrode layer is not formed and the glue line is formed in the front face of an electrode layer or a self-standing green sheet, the imprint nature of an electrode layer, the detachability of a support sheet, and laminating precision can improve, and highly efficient laminating components without a poor short circuit, a defect, etc. can be manufactured.

[0125]

moreover, after the sheet of a thin layer has also exfoliated from the support sheet using the reinforcement of for example, a self-standing green sheet being alike compared with the conventional green sheet, and high by using the green sheet with an electrode and the sheet for laminating components manufacture concerning this invention, a laminating can be performed, and quality laminating components without a short circuit or a defect can be manufactured.

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of a stacked type ceramic condenser manufactured with the application of this invention.

[Drawing 2] It is the important section outline sectional view showing an example of the sheet for laminating components manufacture of this invention.

[Drawing 3] It is drawing for explaining the 1st manufacture approach of a stacked type ceramic condenser, and is the important section outline sectional view showing a release layer formation process.

[Drawing 4] It is drawing for explaining the 1st manufacture approach of a stacked type ceramic condenser, and is the important section outline sectional view showing an electrode layer and a margin pattern stratification process.

[Drawing 5] It is drawing for explaining the 1st manufacture approach of a stacked type ceramic condenser, and is the important section outline sectional view showing a glue line formation process.

[Drawing 6] (a) is the mimetic diagram of the equipment for manufacturing the sheet for laminating components manufacture, it is drawing for explaining the 1st manufacture approach of a stacked type ceramic condenser, and (d) is [(b) is the important section outline sectional view of the self-standing green sheet supplied from the 2nd supply roll, and / (c) is important section outline sectional views, such as a carrier sheet supplied from the 1st supply roll, and] the important section outline sectional view of the sheet for laminating components manufacture rolled round by the winding roll.

[Drawing 7] It is drawing for explaining the manufacture approach of a stacked type ceramic condenser, and the outline sectional view in which (a) shows the preliminary pressurization process of a green sheet with an electrode, the outline sectional view in which (b) shows the last pressurization process, the outline sectional view in which (c) shows the cutting process of a layered product, and (d) are the outline perspective views showing the Green chip with which it was cut.

[Drawing 8] It is the outline sectional view showing an example of the laminating approach of a layered product.

[Drawing 9] It is the outline sectional view showing other examples of the laminating approach of a layered product.

[Drawing 10] It is the outline sectional view showing the example of further others of the laminating

approach of a layered product.
[Drawing 11] It is drawing for explaining the 2nd manufacture approach of a stacked type ceramic condenser, and is the important section outline sectional view showing the process which pastes up a self-standing green sheet on a carrier sheet possible [exfoliation].
[Drawing 12] (a) is the mimetic diagram of the equipment for pasting up a self-standing green sheet on a carrier sheet, it is drawing for explaining the 2nd manufacture approach of a stacked type ceramic condenser, and (d) is [(b) is the important section outline sectional view of the self-standing green sheet supplied from the 2nd supply roll, and / (c) is important section outline sectional views, such as a carrier sheet supplied from the 1st supply roll, and] the important section outline sectional view of the carrier sheet rolled round by the winding roll.
[Drawing 13] It is drawing for explaining the 2nd manufacture approach of a stacked type ceramic condenser, and is the important section outline sectional view showing the glue line formation process by the replica method.
[Drawing 14] (a) is the mimetic diagram of the equipment for manufacturing the sheet for laminating components manufacture, it is drawing for explaining the 2nd manufacture approach of a stacked type ceramic condenser, and (d) is [(b) is the important section outline sectional view of the self-standing green sheet supplied from the 2nd supply roll, and / (c) is important section outline sectional views, such as a carrier sheet supplied from the 1st supply roll, and] the important section outline sectional view of the sheet for laminating components manufacture rolled round by the winding roll.
[Drawing 15] It is the important section outline sectional view showing other examples of the sheet for laminating components manufacture of this invention.
[Drawing 16] It is the important section outline sectional view showing the example of further others of the sheet for laminating components manufacture of this invention.
[Drawing 17] It is the important section outline sectional view showing the example of further others of the sheet for laminating components manufacture of this invention.
[Description of Notations]
1 Stacked Type Ceramic Condenser, 2 Glue Line, 26 Self-standing Green Sheet, 51 Carrier Sheet, 52 Binder Layer, 61 Carrier Sheet Capacitor Element Pack, 3 1st Terminal Electrode, 4 2nd Terminal Electrode, 5 Dielectric Layer, 6 Internal Electrode Layer, 10 Sheet for Laminating Components Manufacture, 20 Green Sheet with Electrode, 21 Carrier Sheet, 22 Stratum Disjunctum, 23 Electrode Layer, 24 Margin Patterned Layer, 25

[Translation done.]

* NOTICES *

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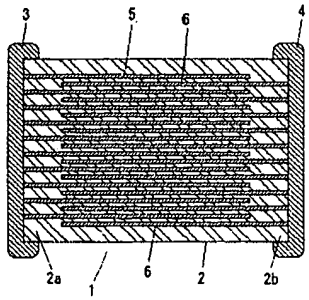
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



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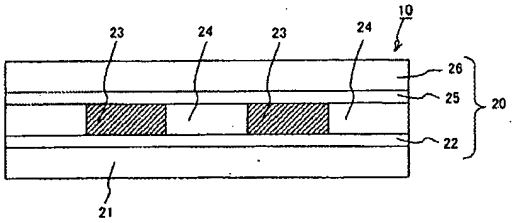

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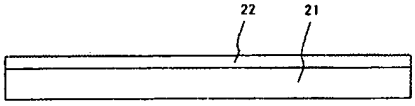

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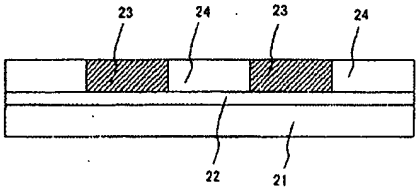

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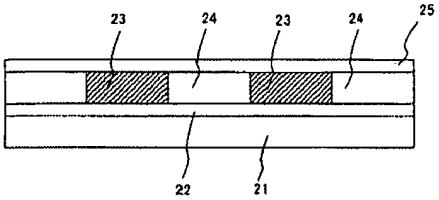

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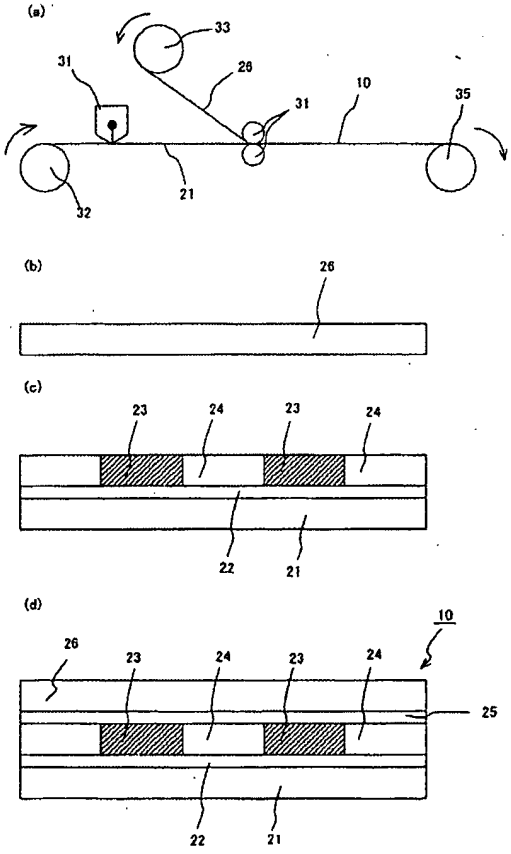

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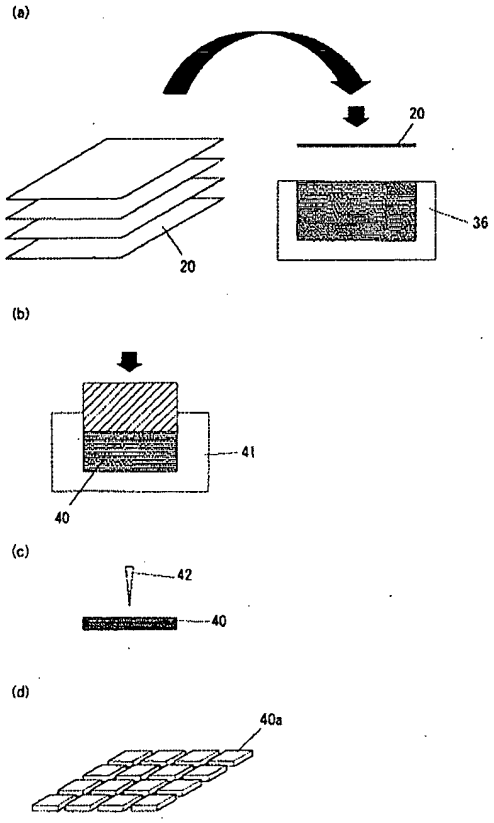

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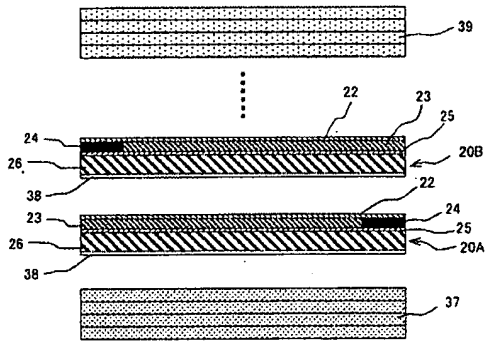

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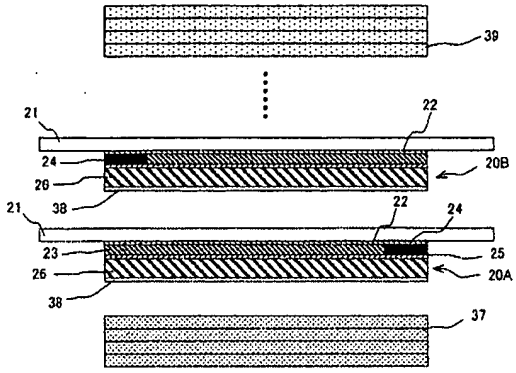

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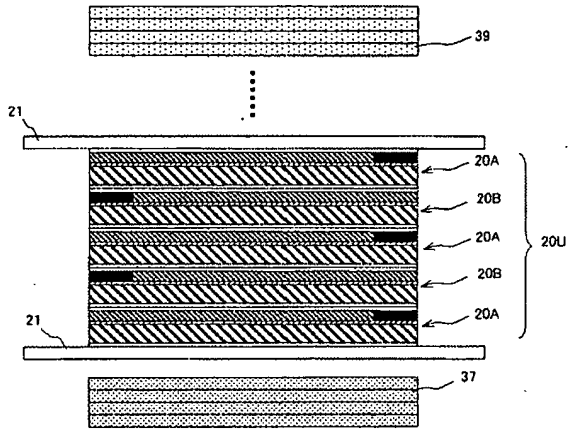

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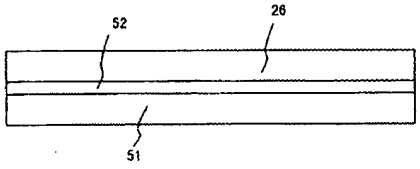

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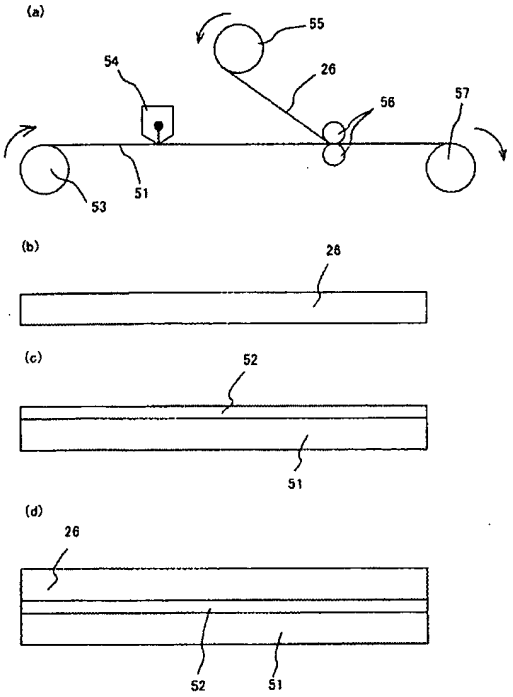
(a)
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(b)
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(c)
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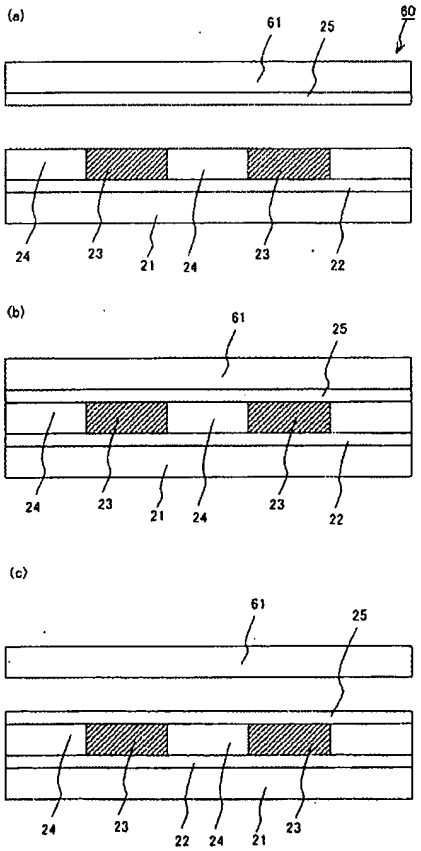
[Drawing 13]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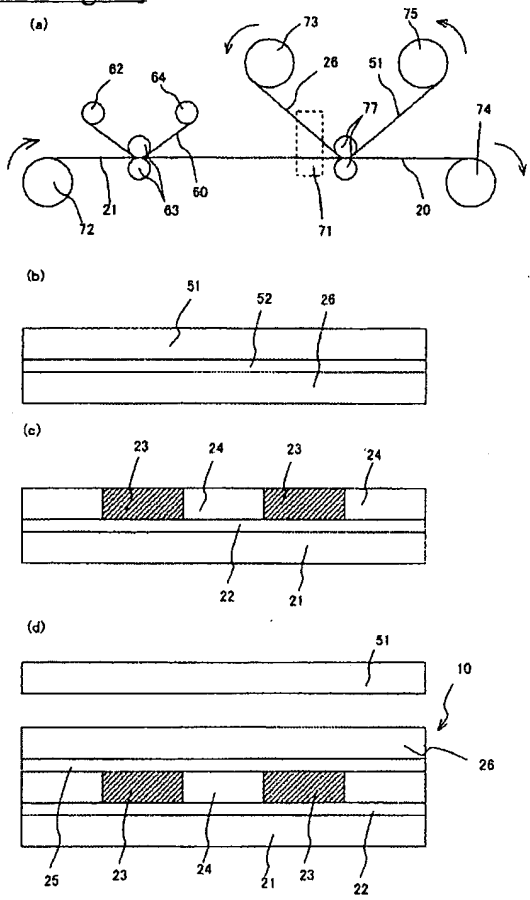
[Drawing 14]



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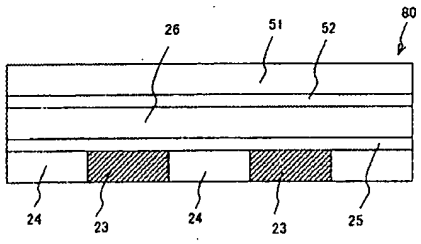
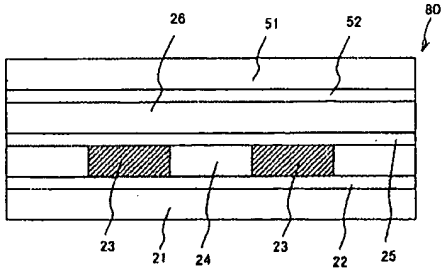


[Drawing 16]



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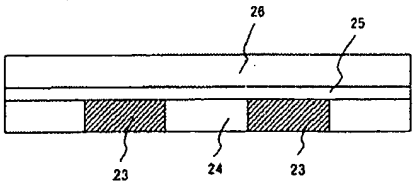

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